Movement monitoring

*Visitor flow surveillance using a thermal IR sensor and WiFi scanning*

Report

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Semester: VT22

Course code: 2DT304

# Abstract

Monitoring people is a subject that holds many difficulties. One of them is integrity. Many modern solutions use cameras and machine learning to detect people. But cameras also give many people the feeling of that someone is watching them and for some spaces cameras are simply not allowed. Those are the arguments for looking at alternative solutions when detecting people. An ultrasonic sensor can sense if someone passes it but not in which direction, that will require two of them.

The idea for this project is to use an 8x8 IR thermal sensor for detection of people. The sensor has pixels just like a camera, but the 64 pixels are temperatures instead of colours. This hopefully gives the ability to calculate the direction of a human’s movements and can thereby keep track of how many enters and how many leaves a room with just one sensor and without using a camera. The sensor will be connected to a IoT device which has a Wi-Fi component. The Wi-Fi will be used not only for transferring data to the cloud but also for detecting nearby smartphones. This data can then be used to estimate how many people that are in the nearby area of the device and for how long they stay there.

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# Introduction

Introduce your work/project to the reader. Keep it light, do not go into details. Introduce the field of your work/project, your motivations for choosing this topic, etc.

The following list shows a set of aspect you should discuss in the introduction. The list is just a guideline and not a checklist, therefore you can as many additional information as you want.

* Introduction to the topic
* What is the purpose of your work/project
* Motivation
* What is the novelty in your work/project
* What is the complexity in your work/project
* What is the improvement/innovation that your work/project give w.r.t. the state of the art
* …
* How the document is structured

# Background / State of The Art

***Heading 1***text format style is for Sections X. This is an example of paragraph with some random content random content random content random content random content. New paragraphs are indented.

In the state of the art section you should describe the field in which your work or project is positioned. Describe what has been done up to now and how/in which way your work is different/better w.r.t. the works already present in literature. Emphasize the novelty of your project.

These [1], [2-4], [1,5] are examples of citations. Citations have to be made with numbers between square brackets. You can write them manually or use any sort of tool that manages references and bibliography that you like.

These are examples of reference to element in the document: see Section 2.1 (or Subsection 2.1), please refer to Section 4, in Figure 3 is depicted, the results reported in Table 5, etc. We do not specify rules for numbering figures and tables (captions in general), but please keep a monotonic increasing numbering attitude without skipping values.

# Planning

* Describe what are the milestones you identified in your work/project
* Describe how you planned to develop your work/project.
* If multiple persons work together, describe approximatively how the work will be/has been split among all the team members.

# Developing process

* Describe the developing process you have chosen to adopt
* Why you choose it
* Present and explain all the design and development choices you want to do
  + The HW, SW and languages you decide to adopt
* Present and explain any design assumption/approximation you do during the development of your work.
  + If you do so, discuss what are the consequences of those choices

## Subsection 1.1 title example

***Heading 2***  text format style is for SubSection X.X. This is an example of paragraph with some random content random content random content random content random content

### SubSubSection 1.1.1 title example

***Heading 3***  text format style is for SubSubSection X.X.X. This is an example of paragraph with some random content random content random content random content random content.

# Implementation

Describe how you did your work. Take your time and organise all the content in a readable and LOGIC way. Do not jump left and right during your presentation. Follow a straight line of thoughts while presenting your content. Present crucial concepts/ideas/stuff before they are needed for the comprehension of other contents later in the document.

**DO** **NOT** take the assumption that the reader knows what you are talking about. It is useful to re-describe concepts or things if those have been not mentioned since quite some time/lines/chapter/section etc. Use references to guide and help the reader following your presentation. References can be used to recall the attention of the reader on something that can be either under current illustration or described previously in the document.

* Recall concept expressed in other sections
* If you use a Figure/Table/Graph make sure to refer to it in the text at least once. The reader cannot infer your material.
* If a Figure/Table/Graph is big/full of stuff/complex element, its presentation can be long and verbose. Therefore, referring to it multiple times can help the reader to stay on track and to keep in mind what you are talking about.

In this section, there should also present all the experimentations you have done. You can organise different set of experiments with several subsections so to not create a very long section. One long section is not forbidden, but if it contains multiple subset of information, then dividing those subset in subsections will improve the document quality under many aspects (readability and comprehension, organisation and structure, easier referencing, etc.).

# Discussion and final remarks

* Discussion about the results you obtained
* Are your results in line with your expectations?
* Did you achieve the results you were aiming for?
* Did you encounter any problems during the development and implementation?
  + Describe them
  + Describe how you solved it
  + Describe what development/design decisions you had to made due to these problems
  + Describe workarounds/approximations/hypothesis you made or had to made
  + Etc.

# Conclusions

This part concludes your document and must contain crucial information:

* A recall to the introduction
  + Motivation, novelty, complexity
  + Objectives and goals
* State of the art
  + Differences between your work and the SoTA
* Short summary of your
  + Implementation
  + Development
  + Results obtained
* Conclusion and final discussions

# References

[1]  Linnaeus University. (2015) Course Room for Degree Projects. [Online]. Available: https://mymoodle.lnu.se/course/view.php?id=5297#section-4

[2]  Monash University. (2015, Oct. 13) Citing and referencing: IEEE. [Online]. Available: http://guides.lib.monash.edu/citing-referencing/ieee

[3]  C. Lynch, “Big data: How do your data grow?” Nature, vol. 455, pp. 28–29, 2008.

[4]  S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 3rd ed. Prentice Hall, 2010.

[5]  D. Agrawal, S. Das, and A. E. Abbadi, “Big data and cloud computing: current state and future opportunities,” in Proceedings of the 14th International Conference on Extending Database Technology, 2011, pp. 530–533.